

REMARKS

Claims 1, 2, 4, 5, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamamoto in view of Gao et al., US 6,277,521 B1 ("Gao"). Claim 3, 6, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamamoto in view of Gao as applied to claim 1 above, and further in view of Hibara et al., JP 2002-158035, machine translation. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamamoto in view of Gao as applied to claim 1 above, and further in view of Ogino et al., US 5,153,082 B1 ("Ogino").

Reconsideration and removal of these rejections is respectfully requested in view of the amendments to the claims and the remarks that follow.

Claim 1 has been amended, first, to precisely recite that the amounts of the group IVA element and group IIIA element contained in the lithium cobalt oxide active material of the positive electrode are based on the total amount of the metal elements other than lithium. This limitation is supported in the specification of the present application, for example, by the description in Example 1 of the mixing of raw materials to provide a molar ratio of Li:Co:Zr:Mg of 1:0.99:0.005:0.005 (paragraph [0025]) and the

identification in Table 1 of the content of Zr and Mg as being 0.5 mol % (Table 1).

Claim 1 has been amended, second, to recite that the lithium cobalt oxide is obtained by mixing raw materials for preparing the lithium cobalt oxide with raw materials of the group IVA element and the group IIA element and heat treating the mixed raw materials. This amendment is supported by the description in paragraph [0025] of the present specification.

The combination of Hamamoto and Gao is insufficient to support a case of *prima facie* obviousness under 35 U.S.C. § 103(a) of claims 1, 2, 4, 5 and 7, as amended.

The Office states on page 3 of the Office Action that "Gao teaches a lithium secondary battery with a positive electrode comprised of an exemplary intercalation compound  $\text{LiNi}_{0.15}\text{Co}_{0.15}\text{Ti}_{0.05}\text{Mg}_{0.05}\text{O}_2$  which has 1.6 mol % of a Group IVA element (Ti) and 1.6 mol % of a Group IIA element". However, the content of each of Ti (Group IVA element) and Mg (Group IIA element), 1.6 mol %, is calculated with respect to the total amount of the all elements including lithium (Li) and oxygen (O). When the content of each of Ti and Mg is calculated with respect to the total amount of the metal elements other than lithium, the content is 5 mol %.

This content is outside the ranges of the group IVA element and group IIA element defined in the claims of the application.

The proposed combination of Gao with Hamamoto, therefore, will not result in the nonaqueous electrolyte secondary battery defined in the claims of the application. For this reason, the rejection of claims 1, 2, 4, 5 and 7 under 35 U.S.C. § 103(a) is not proper and should be removed.

The propriety of the rejections of claims 3, 6, 8, 9 and 11 depends on the propriety of the rejection of claim 1 on which these claims depend, directly or indirectly. Since claim 1 has been shown to be patentable over the combination of Hamamoto and Gao, claims 3, 6, 8, 9 and 11 are *prima facie* patentable.

Moreover, the amendment to claim 1 to recite that the lithium cobalt oxide is obtained by mixing raw materials for preparing the lithium cobalt oxide with raw materials of the group IVA element and the group IIA element and heat treating the mixed raw materials limits the lithium cobalt oxide to one in which the group IVA element and the group IIA element are distributed evenly in a whole of the lithium cobalt oxide.

Although it is not entirely clear why the Office, in the "Response to Arguments" section of the Final Action, describes alleged differences between the lithium cobalt oxide of the

positive electrode of the present invention and that of Cho et al., US 6,436,582 B1, since the rejections based on prior art combinations including Cho have been removed, applicants note that Cho discloses that the solid-solution compound is prepared by reacting a lithiated intercalation compound and an oxide compound represented by  $M_pM'_qO_r$  in paragraph [0032]. Therefore, according to Cho, a group IVA element and a group IIA element are contained only in a surface portion of lithium cobalt oxide and are not contained in a core portion of lithium cobalt oxide.

For this reason also, the nonaqueous electrolyte secondary battery defined by claims 1-9 and 11 of the application as amended are patentable under 35 U.S.C. § 103(a) over the prior art.

New claims 12-15 have been added to the application. Claim 12 defines the nonaqueous electrolyte secondary battery of the present invention as including a negative electrode containing a graphite material as the negative active material, a positive electrode containing lithium cobalt oxide as a main component of the positive active material and a nonaqueous electrolyte solution, the battery being characterized in that the lithium cobalt oxide contains a

group IVA element and a group IIA element of the periodic table and the nonaqueous electrolyte solution contains 0.2 - 1.5 % by weight of divinyl sulfone and further contains vinylene carbonate. (See, for example, Examples 4 and 5 in the present specification).

Claims 13 and 14 limit the content of the vinylene carbonate and divinyl sulfone of the nonaqueous electrolyte solution, respectively, and claim 15 recites that the lithium cobalt oxide is obtained by mixing raw materials for preparing a lithium cobalt oxide with raw materials of said group IVA element and said group IIA element and heat treating the mixed raw materials (as now recited in claim 1).

The data of Table 1 of the present specification show that the battery of the present invention as defined in claims 1-9, 11, and 12-15, Batteries A1 - A5, not only show suppressed battery swelling after being stored in the charged state but also exhibit improved capacity restoration. These results are unexpected and support the non-obviousness of the claimed battery.

The foregoing is believed to be a complete and proper response to the Office Action dated March 5, 2009.

PATENT APPLN. NO. 10/563,124  
SUBMISSION UNDER 37 C.F.R. § 1.114

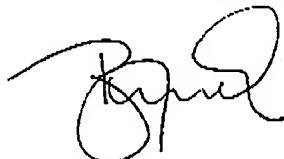
PATENT

In the event that this paper is not considered to be timely filed, applicant(s) hereby petition(s) for an appropriate extension of time. The fee for any such extension may be charged to our Deposit Account No. 111833.

In the event any additional fees are required, please also charge our Deposit Account No. 111833.

Respectfully submitted,

KUBOVCIK & KUBOVCIK



Ronald J. Kubovcik  
Reg. No. 25,401

Crystal Gateway 3  
Suite 1105  
1215 South Clark Street  
Arlington, VA 22202  
Tel: (703) 412-9494  
Fax: (703) 412-9345  
RJK/ff